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SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN THAT I, JUNICHI MINATO, a citizen of Japan residing at Kanagawa, Japan have invented certain new and useful improvements in

IMAGE PROCESSING DEVICE, IMAGE PROCESSING METHOD AND REMOTE-SCAN IMAGE PROCESSING SYSTEM USING THE SAME

of which the following is a specification:-

BACKGROUND OF THE INVENTION

1. Field of The Invention

The present invention relates to an image processing device and method for use in a remote-scan image processing system 5 wherein image data, read from documents by using a scanner unit (or a digital still camera or a video camera) of the image processing device, are transmitted from the image processing device to an external computer among a plurality of external computers across a network. Further, the present invention relates to a remote-scan 10 image processing system using the image processing device and method.

2. Description of The Related Art

In recent years, the wide-spread use of personal computers (PC) and local area networks (LAN) makes it possible that a remote-scan 15 image processing system transmit image data, read from documents by using a scanner unit (or a video camera or a digital still camera), from an image processing device to a desired external computer (the destination) among a plurality of external computers across a local area network.

When transmitting an image file from the image processing device to the destination (the desired one among the plurality of personal computers) in a small-office LAN environment, there is a case in which the receiver workstation is the same as the sender workstation. When transmitting a fax to a desired external station, 25 the receiver which receives the fax is normally external equipment

outside the LAN, and it is necessary that the identification of the sender be included in the transmitted fax, in order to inform the receiver who has sent the fax.

If an image file is transmitted to the receiver's PC without 5 indication of the sender's identification or the like, it is inconvenient to the receiver, and the purpose of the transmission of the image file in such a case is unclear to the receiver. If the image file is transmitted to the receiver's PC with a clear indication of the sender's identification and it is recognizable to the receiver before 10 opening of the received image file, the convenience of the remote scanning capability of the image processing system to the users would be increased.

Further, when transmitting a fax to a desired external station, the image of the transmitted fax is simply printed at the receiver's 15 equipment. However, when transmitting an image file from the image processing device to the desired external computer across the LAN, it is desired to cause the receiver's computer to perform various post-processing procedures of the image file after the reception of the image file at the receiver's computer, in order to 20 increase the convenience of the image processing system's remote scanning to the users.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved 25 image processing device, an improved image processing method and

an improved image processing system in which the above-described problems are eliminated.

Another object of the present invention is to provide an image processing device that allows the receiver of the image file to immediately recognize the sender's identification, in order to increase the convenience of the remote scanning capability to the users.

Another object of the present invention is to provide an image processing device that allows the receiver of the image file to immediately overview the contents of the image file or the like, in order to increase the convenience of the remote scanning capability to the users.

Another object of the present invention is to provide an image processing device that allows the receiver's computer to perform various post-processing procedures of the image file after the reception of the image file, in order to increase the convenience of the remote scanning capability to the users.

Another object of the present invention is to provide an image processing method that allows the receiver of the image file to immediately recognize the sender's identification, in order to increase the convenience of the remote scanning capability to the users.

Another object of the present invention is to provide an image processing method that allows the receiver of the image file to immediately overview the contents of the image file or the like, in

order to increase the convenience of the remote scanning capability to the users.

Another object of the present invention is to provide an image processing method that allows the receiver's computer to perform 5 various post-processing procedures of the image file after the reception of the image file, in order to increase the convenience of the remote scanning capability to the users.

Another object of the present invention is to provide a remote-scan image processing system which allows the receiver of the image 10 file to immediately recognize the sender's identification, in order to increase the convenience of the remote scanning capability to the users.

Another object of the present invention is to provide a remote-scan image processing system which allows the receiver of the image 15 file to immediately overview the contents of the image file or the like, in order to increase the convenience of the remote scanning capability to the users.

Another object of the present invention is to provide a remote-scan image processing system which allows the receiver's computer 20 to perform various post-processing procedures of the image file after the reception of the image file, in order to increase the convenience of the remote scanning capability to the users.

The above-mentioned objects of the present invention are achieved by an image processing device which transmits an image 25 file to one of a plurality of external stations through a network, the

image processing device comprising: a destination registering unit which stores a destination identifier of the image file, the destination identifier indicating one of the external stations to which the image file is transmitted from the image processing device; a 5 sender registering unit which stores a sender identifier of the image file, the sender identifier indicating a person or group who sends the image file to said one of the external stations; and a transmission unit which transmits the image file, together with the stored sender identifier, through the network to said one of the external stations 10 indicated by the stored destination identifier.

The above-mentioned objects of the present invention are achieved by an image processing method which transmits an image file to one of a plurality of external stations through a network, the image processing method comprising the steps of: storing a 15 destination identifier of the image file, the destination identifier indicating one of the external stations to which the image file is transmitted from the image processing device; storing at least one of a sender identifier of the image file, a subject identifier of the image file and a scan condition of the image file; and transmitting the 20 image file, together with said at least one of the sender identifier, the subject identifier and the scan condition, through the network to said one of the external stations indicated by the stored destination identifier.

The above-mentioned objects of the present invention are 25 achieved by a remote-scan image processing system including an

image processing device and a plurality of external stations connected to the image processing device through a network, the image processing device comprising: a scanner unit which photoelectrically scans a document to read image data from the 5 document, the scanner unit provided with an automatic document feeder transporting the document to the scanner unit before the reading of the image data; an image memory which stores the image data read by the scanner unit; a transmission unit which transmits an image file derived from the image data stored in the image memory, 10 to one of the plurality of external stations through the network; and an operation unit which input key-in information to select one of the external stations as a destination station which receives the image file, wherein the one of the external stations receives the image file, transmitted by the transmission unit, in accordance with a selected 15 file format, and the one of the external stations comprises a file format selection unit selecting one of a plurality of file formats as conforming to the image file transmitted by the image processing device.

In the image processing device, method and system of the 20 present invention, a destination identifier of the image file to be transmitted is stored, a sender identifier of the image file is stored, and the image file is transmitted, together with the stored identifier, through the network to one of the plurality of external computers. According to the image processing device, the image processing 25 method and the remote-scan image processing system of the present

invention, it is possible that the receiver of the image file immediately recognize the identifier of the sender, the image subject or the scan condition, in order to increase the convenience of the remote scanning capability to the users. The image processing device, method and system of the present invention are effective in enabling the receiver of the image file to immediately overview the contents of the image file or the like, so as to increase the convenience of the remote scanning capability to the users. The image processing device, method and system of the present invention are effective in enabling the receiver's computer to perform various post-processing procedures of the image file after the reception of the image file, in order to increase the convenience of the remote scanning capability to the users.

15 BRIEF DESCRIPTION OF THE DRAWINGS

Other objects, features and advantages of the present invention will be apparent from the following detailed description when read in conjunction with the accompanying drawings.

FIG. 1 is a block diagram of a first preferred embodiment of the remote-scan image processing system of the invention.

FIG. 2 is a flowchart for explaining a list storing procedure executed by the image processing device of the present embodiment to store a destination list, a sender list and an image subject list.

FIG. 3 is a flowchart for explaining a registering procedure executed by the image processing device of the present embodiment.

FIG. 4 is a flowchart for explaining an image file transmission procedure executed by the image processing device of the present embodiment.

5 FIG. 5 is a diagram for explaining an initial-menu screen displayed on a display unit of the image processing device of the present embodiment.

FIG. 6 is a diagram for explaining a destination list screen displayed on the display unit of the image processing device of the present embodiment.

10 FIG. 7 is a diagram for explaining a sender list screen displayed on the display unit of the image processing device of the present embodiment.

15 FIG. 8 is a diagram for explaining a subject list screen displayed on the display unit of the image processing device of the present embodiment.

FIG. 9 is a diagram for explaining a scan condition list screen displayed on the display unit of the image processing device of the present embodiment.

20 FIG. 10 is a flowchart for explaining a scanning procedure executed by a second preferred embodiment of the image processing system of the invention.

FIG. 11 is a flowchart for explaining an image file transmission procedure executed by the image processing system of the present embodiment.

25 FIG. 12 is a flowchart for explaining an image file receiving

procedure executed by the image processing system of the present embodiment.

FIG. 13 is a flowchart for explaining an image file retransmission procedure executed by the image processing system 5 of the present embodiment.

FIG. 14 is a flowchart for explaining a file format selection procedure executed by the image processing system of the present embodiment.

10 FIG. 15 is a diagram for explaining a file format storing screen displayed on the external computer.

FIG. 16 is a flowchart for explaining a scanning procedure executed by the image processing system of the present embodiment.

15 FIG. 17A, FIG. 17B, FIG. 17C and FIG. 17D are diagrams for explaining various operational screens displayed in the image processing device of the present embodiment.

FIG. 18 is a flowchart for explaining a scanning procedure executed by the image processing system of the present embodiment.

20 FIG. 19A, FIG. 19B, FIG. 19C and FIG. 19D are diagrams for explaining various operational screens displayed in the image processing device of the present embodiment.

FIG. 20 is a diagram showing a document name input screen displayed in a third preferred embodiment of the image processing system of the invention.

25 FIG. 21 is a diagram for explaining a structure of image files stored in the image memory of the image processing device of the

present embodiment.

FIG. 22 is a flowchart for explaining an image processing procedure executed by the image processing system of the present embodiment.

5 FIG. 23 is a diagram for explaining an operational screen displayed in the image processing device of the present embodiment.

FIG. 24 is a diagram for explaining operational screens displayed in the image processing device of the present embodiment.

10 FIG. 25 is a diagram for explaining a structure of image files stored in the image memory of the image processing device of the present embodiment.

FIG. 26 is a flowchart for explaining an image file transmission procedure executed by the image processing system of the present embodiment.

15 FIG. 27 is a diagram for explaining a file combining process.

FIG. 28 is a flowchart for explaining a file combining procedure executed by the image processing system of the present embodiment.

20 FIG. 29 is a block diagram of a fourth preferred embodiment of the image processing system of the invention.

FIG. 30 is a flowchart for explaining an image data storage procedure executed by the image processing system of the present embodiment.

25 FIG. 31A and FIG. 31B are diagrams for explaining input screens displayed in the image processing device of the present

embodiment.

FIG. 32 is a flowchart for explaining a portion of a file combining procedure executed by the image processing system of the present embodiment.

5 FIG. 33 is a flowchart for explaining another portion of the file combining procedure executed by the image processing system of the present embodiment.

10 FIG. 34A, FIG. 34B, FIG. 34C and FIG. 34D are diagrams showing an example of the file combining process in which plural document files are combined together.

FIG. 35A, FIG. 35B and FIG. 35C are diagrams showing an example of the file combining process in which plural document files are combined together.

15 FIG. 36 is a flowchart for explaining a file combining procedure executed by the image processing system of the present embodiment.

FIG. 37 is a block diagram of a fifth preferred embodiment of the image processing system of the invention.

20 FIG. 38 is a flowchart for explaining an image data storage routine executed by the image processing system of the present embodiment.

FIG. 39 is a flowchart for explaining another image data storage routine executed by the image processing system of the present embodiment.

25 FIG. 40 is a flowchart for explaining another image data

storage routine executed by the image processing system of the present embodiment.

FIG. 41 is a diagram for explaining an image data storage procedure performed in one embodiment of the image processing system of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

A description will now be provided of preferred embodiments of the present invention with reference to the accompanying drawings.

FIG. 1 shows a first preferred embodiment of the remote-scan image processing system of the invention. A description will be given, with reference to FIG. 1 through FIG. 9, of the first preferred embodiment of the remote-scan image processing system of the invention.

In the remote-scan image processing system of the present embodiment, an image processing device 10 and a plurality of external computers (PC) 11, which are connected to the image processing device 10 through a local area network 12 (e.g., the Ethernet), are provided. For the sake of simplicity of description, only one of the plurality of external computers 11 is shown in FIG. 1, and the other external computers 11 are omitted. The image processing device 10, shown in FIG. 1, is one embodiment of the image processing device of the present invention.

As shown in FIG. 1, the image processing device 10 generally includes a scanner unit 1, a CPU (central processing unit) 2, a display unit 3, an image processor 4, a network I/F (interface) unit 5, an image memory 6, an operation unit 7, and a ROM/RAM (read-only memory/random access memory) 8 are provided. These elements of the image processing device 10 are interconnected by a local bus as shown in FIG. 1.

As shown in FIG. 1, the network I/F unit 5 serves to connect the image processing device 10 to a selected one of the local area network 12 and a PSTN (public switched telephone network) 13. In the present embodiment, the network 12 is a known Ethernet network. When the image processing device 10 is connected to the PC 11 via the network 12, a connection of the image processing device 10 and the PC 11 via the network 12 is established by the network I/F unit 5. When the image processing device 10 is connected to external equipment (not shown) via the PSTN 13, a connection of the image processing device 10 and the external equipment via the PSTN 14 is established by the network I/F unit 5.

Suppose that address directory lists related to the PC 11, including a destination list, a sender list, an image subject list and a scan condition list, are stored, in advance, in the ROM/RAM 8. A network administrator (or an operator) causes the remote-scan image processing system to store, in advance, the destination list, the sender list, the image subject list and the scan condition list, which are related to the PC 11, into the ROM/RAM 8 of the image

processing device 10 by making use of a registering program from the ROM/RAM 8. A shared use of these lists for the small-office home-office application and for the wide area network application is considered by using a common entry for the same sender identifier, 5 and the need for performing a duplicate list storing procedure will be eliminated.

A description will be given of operations of the remote-scan image processing system of the present embodiment.

FIG. 2 shows a list storing procedure executed by the remote-scan image processing system of the present embodiment. When the 10 list storing procedure of FIG. 2 is executed, a destination list, a sender list and an image subject list which are received from the related external computer 11 via the network 12 are temporarily stored into the image processing device 10.

15 When a power switch of the image processing device 10 is turned on by the network administrator (or the operator), the list storing procedure, shown in FIG. 2, is started. At a start of the list storing procedure, the CPU 2 of the image processing device 10 (which will called the CPU 2) sends a call to a registered PC (the 20 external computer) 11 in the network 12 (S1). After step S1 is performed, the CPU 2 causes the network I/F unit 5 to establish a connection of the image processing device 10 and the external computer 11 (S2). The CPU 2 sends a request of receiving of a destination list related to the external computer 11, to the external 25 computer 11 (S3). The destination list contains a set of destination

identifiers, and each destination identifier indicates one of the plurality of external computers in the network 12 to which an image file is transmitted from the image processing device 10.

After step S3 is performed, the CPU 2 stores the destination 5 list, received from the external computer 11, into the ROM/RAM 8 (S4). Then, the CPU 2 sends a request of receiving of a sender list related to the external computer 11, to the external computer 11 (S5). The sender list contains a set of sender identifiers, and each sender 10 identifier indicates one of a plurality of sender personnel or groups who send an image file from the image processing device 10 to the destination computer 11 in the network 12.

After step S5 is performed, the CPU 2 stores the sender list, received from the external computer 11, into the ROM/RAM 8 (S6). Then, the CPU 2 sends a request of receiving of an image subject list 15 related to the image file being transmitted, to the external computer 11 (S7). The image subject list contains a set of image subject identifiers, and each subject identifier indicates one of a plurality of image subject indications which indicate the names of the images in the image file being transmitted.

After step S7 is performed, the CPU 2 stores the image subject 20 list, received from the external computer 11, into the ROM/RAM 8 (S8). After step S8 is performed, the list storing procedure of FIG. 2 is finished.

When the list storing procedure of FIG. 2 is finished, the CPU 25 2 of the image processing device 10 performs a registering

procedure based on the stored destination list and the stored sender list. FIG. 3 shows a registering procedure executed by the image processing system of the present embodiment.

As shown in FIG. 3, at a start of the registering procedure, the 5 CPU 2 starts execution of a registering program read from the ROM/RAM 8 (S11). After step S11 is performed, the CPU 2 causes the operator to select one of a destination entry or a sender entry for subsequent operations (S12). When the destination entry is selected as a result of step S12, the CPU 2 performs step S13 and subsequent 10 steps. The CPU 2 causes the operator to input a new destination identifier from the operation unit 7 (S13). The CPU 2 stores the new destination identifier, input by the operator from the operation unit 7, into the destination list previously stored (S14). The CPU 2 stores the same destination identifier, input by the operator from the 15 operation unit 7, into the sender list previously stored (S15). After step S15 is performed, the CPU 2 causes the operator to determine whether the operator wishes to continue to perform the destination entry operation (S16). When the result at step S16 is affirmative, the control of the CPU 2 is transferred to the step S12. Otherwise 20 the CPU 2 performs the next step S22.

On the other hand, when the sender entry is selected as a result of step S12, the CPU 2 performs step S17 and subsequent steps. The CPU 2 reads the previously stored sender list from the ROM/RAM 8 so that the contents of the sender list are displayed on 25 the display unit 3 (S17). The CPU 2 causes the operator to

determine whether the operator wishes to change the stored sender list (S18). When the result at step S18 is negative, the control of the CPU 2 is transferred to the step S22. Otherwise the CPU 2 performs the next step S19. The CPU 2 causes the operator to input a new 5 sender identifier from the operation unit 7 (S19). The CPU 2 stores the new sender identifier, input by the operator from the operation unit 7, into the sender list previously stored (S20). After step S20 is performed, the CPU 2 causes the operator to determine whether the operator wishes to continue to perform the sender entry operation 10 (S21). When the result at step S21 is affirmative, the control of the CPU 2 is transferred to the step S19. Otherwise the CPU 2 performs the next step S22.

When the result at one of the steps S16, S18 and S21 is negative, the CPU 2 performs a subject list entry and storing process 15 by using the registering program (S22). The subject list entry and storing process is performed, in advance, by the network administrator when the image subject list of the image file is managed on the side of the external computer 11. After step S22 is performed, the CPU 2 performs a scan condition entry and storing 20 process by using the registering program (S23). When scan conditions are predetermined, a scan condition selection list (which includes, for example, 100dpi for thumbnail (T/N) images, 300dpi for OCR images and 600dpi for album images) is displayed, during the scan condition entry and storing process of the step S23, and the 25 operator is caused to select one from among those of the scan

condition selection list.

FIG. 4 shows an image file transmission procedure executed by the image processing system of the present embodiment.

At a start of the image file transmission procedure of FIG. 4, 5 an initial-menu screen is displayed on the display unit 3 of the image processing device 10. FIG. 5 shows the initial-menu screen displayed on the display unit of the image processing device of the present embodiment. As shown in FIG. 5, the operator can select the following items from the initial-menu screen: a text/photograph choice (“TEXT/PHOTO”), a resolution choice (“400dpi”), a document auto-feed/one-side feed choice (“AUTO/ONE-SIDE”), a scan condition list selection (“SCAN”), a destination list selection (“DESTN”), a sender list selection (“SENDR”), and a one-side/dual-side selection (“ONE/DUAL”).

15 As shown in FIG. 4, the CPU 2 receives a key-in selection from the operation unit 7 (S31). The CPU 2 determines which of the destination list selection or the sender list selection is input by the operator from the operation unit 7 (S32). When the destination list selection is input by the operator, the CPU 2 performs the next step 20 S33 and subsequent steps. When the sender list selection is input by the operator, the CPU 2 performs the next step S37 and subsequent steps.

When the destination list selection is input by the operator as a result of the step S32, the CPU 2 receives the destination list from 25 the ROM/RAM 8 (S33). The CPU 2 displays the destination list,

received from the ROM/RAM 8, on the display unit 3 (S34).

FIG. 6 shows a destination list screen displayed on the display unit 3 of the image processing device 10 of the present embodiment. The CPU 2 causes the operator to select a desired destination from 5 among a plurality of destination identifiers of the destination list displayed on the display unit 3 (S35). After step S35 is performed, the CPU performs the next step S40 and subsequent steps, which will be described below.

When the sender list selection is input by the operator as a 10 result of the step S32, the CPU 2 receives the sender list from the ROM/RAM 8 (S37). The CPU 2 displays the sender list, received from the ROM/RAM 8, on the display unit 3 (S38).

FIG. 7 shows a sender list screen displayed on the display unit 3 of the image processing device 10 of the present embodiment. 15 After step S38 is performed, the CPU 2 causes the operator to select a desired sender from among a plurality of sender identifiers of the sender list displayed on the display unit 3 (S39). After step S39 is performed, the CPU 2 performs the next step S40 and subsequent steps, which will be described below.

20 In the destination and sender list screens shown in FIG. 6 and FIG. 7, “next” button is provided to indicate the next page of the related list when depressed, “select” button is provided to select the desired destination or sender from the destination or sender list when depressed, and “end” button is provided to finalize the 25 selected item from the related list when depressed. After the “end”

button is depressed, the indication of the display unit 3 is returned to the initial menu shown in FIG. 5, which allows the operator to select another item by depressing any of the various list selection buttons. In the present example, the operator first selects the 5 destination identifier from the destination list, and depresses the "end" button so that the indication of the display unit 3 is returned to the initial menu, and then the operator selects any of the sender, the scan condition and the image subject starting from the initial menu.

10 With the initial menu displayed, the CPU 2 determines which of the image subject choice or the scan condition choice is input by the operator from the operation unit 7 (S40). When the image subject choice is input by the operator, the CPU 2 performs the next step S41 and subsequent steps. When the scan condition choice is 15 input by the operator, the CPU 2 performs the next step S44 and subsequent steps.

When the image subject choice is input by the operator as a result of the step S40, the CPU 2 receives the image subject list from the ROM/RAM 8 (S41). The CPU 2 displays the image subject 20 list, received from the ROM/RAM 8, on the display unit 3 (S42).

FIG. 8 shows an image subject list screen displayed on the display unit 3 of the image processing device 10 of the present embodiment. The "next" button, the "select" button and the "end" button of the list screen shown in FIG. 8 are the same as the 25 corresponding buttons shown in FIG. 6 or FIG. 7. The CPU 2 causes

the operator to select a desired image subject from among a plurality of image subjects of the image subject list displayed on the display unit 3 (S43). After step S43 is performed, the CPU performs the next step S47, which will be described below.

5 When the scan condition choice is input by the operator as a result of the step S40, the CPU 2 receives the scan condition list from the ROM/RAM 8 (S44). The CPU 2 displays the scan condition list, received from the ROM/RAM 8, on the display unit 3 (S45).

10 FIG. 9 shows a scan condition list screen displayed on the display unit 3 of the image processing device 10 of the present embodiment. The "next" button, the "select" button and the "end" button of the list screen shown in FIG. 9 are the same as the corresponding buttons shown in FIG. 6 or FIG. 7. After step S45 is 15 performed, the CPU 2 causes the operator to select a desired scan condition from among a plurality of scan conditions of the scan condition list displayed on the display unit 3 (S46).

After the step S43 or the step S46 is performed, the CPU 2 performs an image file transmission procedure (S47). In the present 20 embodiment, the image file is transmitted, together with any of the selected sender identifier, the selected image subject and the selected scan condition, through the network 12 to the external computer 11 (the destination) among the external computers.

According to the image processing device, the image 25 processing method and the remote-scan image processing system of

the present invention, it is possible that the receiver of the image file immediately recognize the sender or scan condition or image subject identification, in order to increase the convenience of the remote scanning capability to the users.

5 Next, a description will be given, with reference to FIG. 10 through FIG. 19D, of a second preferred embodiment of the remote-scan image processing system of the invention.

FIG. 10 shows a scanning procedure executed by the second preferred embodiment of the image processing system of the 10 invention. In the present embodiment, one of a book-type document and a cut-sheet document is scanned by the scanner unit 1 to read image data from the document, and an image file is created from the image data in accordance with a defined file format.

The remote-scan image processing system of the present 15 embodiment is essentially the same as that of the previous embodiment shown in FIG. 1, and a description thereof will be omitted. In the image processing system of the present embodiment, the image processing device 10, and the plurality of external computers (PC) 11, connected to the image processing device 10 20 through the local area network 12, are provided.

At a start of the scanning procedure of FIG. 10, an initial-menu screen is displayed on the display unit 3 of the image processing device 10 (S51). The CPU 2 receives a key-in destination and a key-in scan condition which are input by the 25 operator from the operation unit 7 with the initial menu displayed

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(S52). The CPU 2 causes the operator to set a document on a contact glass of the scanner unit 1 or an automatic document feeder (ADF) of the scanner unit 1 (S53). In the present embodiment, the scanner unit 1 of the image processing device 10 is provided with the ADF. When the document to be scanned is a book-type document, it is set on the contact glass. When the document to be scanned is a cut-sheet document, it is set on the ADF. After the step S53 is performed, the CPU 2 causes the operator to depress the start button in the operation unit 7 to start the scanner unit 1 (S54).

After the step S54 is performed, the CPU 2 performs the image reading of the document by controlling the scanner unit 1 (S55). The CPU 2 stores the image data obtained at the step S55 and the selected destination received at the step S52 into the image memory 6 (S56).

The CPU 2 determines whether an end of the image reading is detected by the scanner unit 1 (S57). When the result at step S57 is negative, the control of the CPU 2 is transferred to the step S55.

When the result at step S57 is affirmative, the CPU 2 reads a defined file format from the ROM/RAM 8 (S58). The CPU 2 reads a set of the stored image data from the image memory 6 (S59). The CPU 2 creates an image file from the read image data in accordance with the read file format (S60). After the step S60 is performed, the scanning routine of FIG. 10 is finished. When an image file transmission procedure is further performed, the control of the CPU 2 is transferred to step S72 of the image file transmission procedure

of FIG. 11.

FIG. 11 shows an image file transmission procedure executed by the image processing system of the present embodiment. In the present embodiment, an image file is transmitted from the image processing device 10 to the external computer 11 across the network 12.

At a start of the image file transmission procedure of FIG. 11, the CPU 2 of the image processing device 10 detects the storage of image files in the image memory 6 (S71). The CPU 2 sends a call to the external computer 11 across the network 12, which computer is designated as the destination of the image files to be transmitted (S72). After step S72 is performed, the CPU 2 causes the network I/F unit 5 to establish a connection of the image processing device 10 and the external computer 11 (S73).

After the connection of the image processing device 10 and the external computer 11 is established, the CPU 2 reads one of the stored image files from the image memory 6 (S74). The CPU 2 transmits the image file from the image processing device 10 to the external computer 11 across the network 12 (S74). The CPU 2 determines whether all the image files are transmitted to the external computer 11 (S76). When the result at step S76 is negative, the control of the CPU 2 is transferred to the step S74.

When the result at step S76 is affirmative, the CPU 2 controls the network I/F unit 5 to release the connection of the image processing device 10 and the external computer 11 (S77). After the

step S77 is performed, the image file transmission procedure of FIG. 11 is finished.

FIG. 12 shows an image file receiving procedure executed by the image processing system of the present embodiment. In the 5 present embodiment, the external computer 11 receives an image file from the image processing device 10 across the network 12.

At a start of the image file receiving procedure of FIG. 12, the 10 CPU of the external computer 11 (which will be called the controller) sends an acknowledge (ACK) signal to the image processing device 10 (will be called the IPD 10) in response to the call sent by the IPD 10 at the step S72 of FIG. 11 (S81).

After the connection of the IPD 10 and the external computer 11 is established, the controller receives the image file sent by the IPD 10 via the network 12 (S82). The controller determines whether 15 all the image files sent by the IPD 10 are received at the external computer 11 (S83). When the result at step S83 is negative, the control of the controller is transferred to the step S82.

When the result at step S83 is affirmative, the controller 20 sends an ACK signal to the IPD 10 in response to the releasing request sent by the IPD 10 so that the connection of the IPD 10 and the external computer 11 is released (S84). After the step S84 is performed, the image file receiving procedure of FIG. 12 is finished. When an image file retransmission procedure is further performed, the controller of the external computer 11 is transferred to step S91 25 of the image file retransmission procedure of FIG. 13.

FIG. 13 shows an image file retransmission procedure executed by the image processing system of the present embodiment.

In the present embodiment, the external computer 11 transmits the image file, received from the image processing device 10, to 5 another external computer among the plurality of external computers 11 across the network 12.

At a start of the image file retransmission procedure of FIG. 13, the controller of the external computer 11 reads the destination from the received image file, the destination indicating the other 10 external computer among the plurality of external computers 11 in the network 12 to which the image file is transmitted (S91). The controller reads the file format given to the destination (S92). The controller reads one of the stored image files (S93). The controller creates an image file from the read image data in accordance with 15 the read file format and stores the converted image file (S94).

After the step S94 is performed, the controller determines whether all the stored image files are read (S95). When the result at step S95 is negative, the control of the controller is transferred to the step S93.

20 When the result at step S95 is affirmative, the controller reads a receiving method given to the destination (S96). The controller reads the converted image file (S97). The controller transmits the converted image file to the destination (the other external computer among the plurality of external computers 11) across the network 12 25 (S98). The controller determines whether all the converted image

files are retransmitted (S99). When the result at step S99 is negative, the control of the controller is transferred to the step S97. When the result at step S99 is affirmative, the image file retransmission procedure of FIG. 13 is finished.

5 FIG. 14 shows a file format selecting procedure executed by the image processing system of the present embodiment.

Suppose that a file format is allocated to each of the plurality of external computers 11 on the network 12 and provides the method of creating an image file to be transmitted to the corresponding 10 external computer as the destination. In the present embodiment, such file formats for the external computers 11 are stored in the form of a file format list, and the operator selects one of the stored file formats from the file format list before the transmission of an image file to the destination.

15 At a start of the file format selecting procedure of FIG. 14, the CPU 2 of the IPD 10 starts execution of the registering program from the ROM/RAM 8 (S111). In the step S111, the operator stores a file format list wherein the file formats are allocated to the 20 respective external computers 11, into the ROM/RAM 8 by inputting the necessary key-in information from the operation unit 7.

After the step S111 is performed, the CPU 2 causes the operator to input a destination identifier that indicates one of the external computers in the network 12 (S112). The CPU 2 reads the 25 file format currently given to the input destination, from the ROM/RAM 8 (S113). The CPU 2 displays the destination identifier

and the file format (S114). The CPU 2 displays the file format list read from the ROM/RAM 8 (S115).

With the file format list displayed, the CPU 2 causes the operator to select one of the stored file formats from the file format list (S116). After the step S116 is performed, the file format selecting procedure of FIG. 14 is finished.

Alternatively, the external computer 11 may start the execution of the file format selecting procedure which is the same as the procedure, shown in FIG. 16, including the steps S111 through S116. In such alternative embodiment, the operator on the external computer 11 may store the file format list wherein a desired file format is allocated to the operator's external computer 11 itself, into the ROM/RAM 8 of the image processing device 10, by inputting the necessary key-in information from the external computer 11 during the execution of the registering program.

FIG. 15 shows a file format storing screen displayed on the external computer in the alternative embodiment mentioned above.

For example, suppose that, in the image processing device 10, the file format of binary image files is set to TIFF-F (Tag Image File Format) that is proposed by Aldus Co., and the file format of M-nary image files is set to JPED format that is proposed by Joint Photographic Coding Experts Group. In the present embodiment, the external computer 11 starts the execution of the registering program, as shown in FIG. 15, and the file format that is the same as that of the file format list of the image processing device 10 is stored as the

file format of a received image file at the external computer 11.

FIG. 16 shows a scanning procedure executed by the image processing system of the present embodiment. FIG. 17A, FIG. 17B, FIG. 17C and FIG. 17D show various operational screens displayed 5 in the image processing device of the present embodiment during the scanning procedure of FIG. 16.

In the present embodiment, one of a book-type document and a cut-sheet document is scanned by the scanner unit 1 to obtain image data from the document, and an image file is created from the image 10 data in accordance with a defined file format.

At a start of the scanning procedure of FIG. 16, the CPU 2 of the IPD 10 displays an initial menu (S121). With the initial menu displayed, the CPU 2 causes the operator to select the destination and the scan condition of an image file to be transmitted, from the 15 initial menu (S122). The CPU 2 causes the operator to set a document on either the contact glass or the ADF of the scanner unit 1 (S123). When the document is a book-type document, the document is set on the contact glass. When the document is a cut-sheet document, the document is set on the ADF.

20 The CPU 2 causes the operator to depress the start button (S124). When the start button is depressed, the operational screen shown in FIG. 17A is displayed on the display unit 3. The CPU 2 controls the scanner unit 1 so that the image reading of the document is performed by the scanner unit 1 (S125). The CPU 2 stores the 25 image data and the destination into the image memory 6 (S126).

After the step S126 is performed, the CPU 2 determines whether the document is set on the contact glass of the scanner unit 1 (S127). When the result at step S127 is affirmative, the operational screen shown in FIG. 17B is displayed on the display unit 3. The CPU 2 determines whether an end of the document is detected by the scanner unit 1 (S128). When the result at step S128 is negative, the control of the CPU 2 is transferred to the step S124.

When the result at step S128 is affirmative, the CPU 2 determines whether the cut-sheet document exists on the ADF (S129). When the result at step S129 is affirmative, the control of the CPU 2 is transferred to the step S124. Otherwise the control of the CPU 2 is transferred to step S131, which will be described below.

When the result at step S127 is negative, the CPU 2 determines whether an end of the document on the ADF is detected (S130). When the result at step S130 is negative, the control of the CPU 2 is transferred to the step S125. Otherwise the CPU 2 causes the operator to depress the "scan end" button (S131).

When the "scan end" button is depressed, the CPU 2 reads the defined file format given to the destination, from the ROM/RAM 8 (S132). The CPU 2 reads a set of the stored image data from the image memory 6 (S133). The CPU 2 creates an image file from the read image data in accordance with the read file format (S134). After the step S134 is performed, the scanning procedure of FIG. 16 is finished.

FIG. 18 shows a scanning procedure executed by the image

processing system of the present embodiment. FIG. 19A, FIG. 19B, FIG. 19C and FIG. 19D show various operational screens displayed in the image processing device of the present embodiment during the scanning procedure of FIG. 18.

5 In the present embodiment, an image file is created when the image data contained in the original document exceeds a maximum page of image data.

10 At a start of the scanning procedure of FIG. 18, the CPU 2 of the IPD 10 displays an initial menu (S141). With the initial menu displayed, the CPU 2 causes the operator to select the destination and the scan condition of an image file to be transmitted, from the initial menu (S142). The CPU 2 causes the operator to set a document on either the contact glass or the ADF of the scanner unit 1 (S143). When the document is a book-type document, the 15 document is set on the contact glass. When the document is a cut-sheet document, the document is set on the ADF.

20 The CPU 2 causes the operator to depress the start button (S144). When the start button is depressed, the operational screen shown in FIG. 19A is displayed on the display unit 3. When the document is the book-type document, the counter "N", which indicates the number of pages scanned in the case of the cut-sheet document, is reset to zero (S145). The CPU 2 controls the scanner unit 1 so that the image reading of the document is performed by the scanner unit 1 (S146). The CPU 2 stores the image data and the 25 destination into the image memory 6 (S147).

After the step S147 is performed, the CPU 2 determines whether the document is set on the contact glass of the scanner unit 1 (S148). When the result at step S148 is negative (the cut-sheet document exists on the ADF), the CPU 2 increments the counter "N" 5 (S150). The CPU 2 determines whether an end of the cut-sheet document is detected by the scanner unit 1 (S151). When the result at step S151 is affirmative, the CPU 2 executes the next step S149, which will be described below. Otherwise the CPU 2 determines whether the count "N" reaches the maximum page (in this example, 10 the maximum page = 100) (S152). When the result at step S152 is affirmative (N = 100), the CPU 2 displays the operational screen, shown in FIG. 19B, on the display unit 3 (S153). With the operational screen of FIG. 19B displayed, the CPU 2 causes the operator to set a next cut-sheet document on the ADF and depress 15 the "OK" button of the operational screen, in order to restart the scanning of the document (S154). When the "OK" button is depressed, the operational screen shown in FIG. 19C is displayed on the display unit 3. After the step S154 is performed, the control of the CPU 2 is transferred to the step S145. Every time the counter 20 "N" is incremented, the number of pages scanned in the operational screen is also incremented.

When the result at step S152 is negative (N < 100), the control of the CPU 2 is transferred to the step S146.

When the result at step S148 or the result at step S151 is 25 affirmative, the operational screen shown in FIG. 19D is displayed

on the display unit 3, and the CPU 2 determines whether the document does not exists on the scanner unit (S149). When the result at step S149 is negative, the control of the CPU 2 is transferred to the step S144. Otherwise the CPU 2 causes the operator to depress the "end" button of the operational screen of FIG. 19D (S155).

When the "end" button is depressed, the CPU 2 reads the defined file format given to the destination, from the ROM/RAM 8 (S156). The CPU 2 reads a set of the stored image data from the 10 image memory 6 (S157). The CPU 2 creates an image file from the read image data in accordance with the read file format (S158). After the step S158 is performed, the scanning procedure of FIG. 18 is finished.

Next, a description will be given, with reference to FIG. 20 15 through FIG. 28, of a third preferred embodiment of the remote-scan image processing system of the invention.

In the present embodiment, the remote-scan image processing system is essentially the same as that of the previous embodiment shown in FIG. 1, and a description thereof will be omitted. In the 20 image processing system of the present embodiment, the image processing device 10, and the plurality of external computers (PC) 11, connected to the image processing device 10 through the local area network 12, are provided.

In the image processing system of the present embodiment, 25 which is described with reference to FIG. 20 through FIG. 22 and

FIG. 1, image data are read from various documents by the scanner unit 1 of the image processing device 10 (which will be called the IPD 10), and the image data are stored in the image memory 6.

FIG. 20 shows a document name input screen displayed on the display unit 3 and the operation unit 7 of the IPD 10 in the image processing system of the present embodiment. FIG. 21 shows a structure of image files stored in the image memory 6 of the IPD 10 of the present embodiment. FIG. 22 shows an image processing procedure executed by the CPU 2 of the IPD 10 in the image processing system of the present embodiment.

At a start of the image processing procedure of FIG. 22, the CPU 2 causes the display unit 3 to display an initial document name thereon (S160). The CPU 2 causes the operator on the operation unit 7 to set a desired document name of image data that will be read from a document and stored in the image memory 6 (S161).

For example, suppose that, as a result of step S161, the operator inputs the document name "19990924171030" from the operation unit 7 as shown in FIG. 20. The CPU 2 causes the display unit to display a request of selection of a desired destination of the image data on the display unit 3 (S162). The CPU 2 receives the destination and scan condition of the image data that are selected by the operator on the operation unit 7 (S163).

After the step S163 is performed, the CPU 2 causes the operator to set the document on the contact glass of the scanner unit 1 or the ADF of the scanner unit 1 (S164). When the document to be

scanned is a book-type document, it is set on the contact glass.

When the document to be scanned is a cut-sheet document, it is set on the ADF. After the step S164 is performed, the CPU 2 causes the operator to depress the start button in the operation unit 7 to start
5 the scanner unit 1 (S165). The CPU 2 temporarily stores the selected destination, obtained at the step S163, into the ROM/RAM 8 (S166).

After the step S166 is performed, the CPU 2 performs the image reading of the document by controlling the scanner unit 1
10 (S167). The CPU 2 stores the image data, obtained at the step S167, into the image memory 6 (S168).

After the step S168 is performed, the CPU 2 determines whether an end of the document is detected by the scanner unit 1 (S169). When the result at step S169 is negative, the control of the
15 CPU 2 is transferred to the step S167. Otherwise the CPU stores the selected destination, the number of pages of the image data and the file format of the image data into the image memory 6 together with the image data (S170). After the step S170 is performed, the image processing procedure of FIG. 22 is finished.

20 For example, suppose that, as a result of step S170, the image data containing 10 pages of images are stored into the image memory 6. In this case, as shown in FIG. 21, 10 pairs of image data file (e.g., "19990924171030-001.IMG") and image format file (e.g., "199909241710-001.PAGEINFO") for the ten-page images as well as
25 a document information file (e.g., "19990924171030.DOCINFO") for

the selected destination, the number of pages and the others are stored in the image memory 6. In this case, the total number of the files stored is 21.

In the image processing system of the present embodiment, 5 which is described with reference to FIG. 23 through FIG. 26 and FIG. 1, the image data of the image memory 6 are transmitted from the image processing device 10 to one of the external computers 11 through the network 12.

FIG. 23 shows an operational screen (document file list) 10 displayed on the display unit 3 and the operation unit 7 of the IPD 10 of the present embodiment. FIG. 24 shows operational screens (initial menu and destination list) displayed on the display unit 3 and the operation unit 7 of the IPD 10 of the present embodiment. FIG. 25 shows a structure of image files stored in the image memory 15 6 of the IPD 10 of the present embodiment. FIG. 26 shows an image file transmission procedure executed by the CPU 2 of the IPD 10 the image processing system of the present embodiment.

At a start of the image file transmission procedure of FIG. 26, the CPU 2 reads the image data of the stored document files from the 20 image memory 6 (S180). The CPU 2 causes the display unit 3 to display a document list, containing a number of document names or identifiers of the document files of the image memory 6, based on the read image data as shown in FIG. 23 (S181). For example, in this case, the document list containing the file name 25 “19990924171030” and others is displayed on the display unit 3.

With the document list displayed, the CPU 2 causes the operator to select a desired document file from the document list by inputting key-in information (S182). After the step S182 is performed, the CPU 2 causes the display unit 3 to invert the 5 indication of the selected document file within the document file list (S183). After the step S183 is performed, the CPU 2 determines whether all the document files that should be transmitted are selected (S184).

When the result at step S184 is negative, the control of the 10 CPU 2 is transferred to the step S182. Otherwise the CPU 2 determines whether the operator desires to combine the document files together prior to the image file transmission (S185).

When the result at step S185 is negative (or when the operator does not desire the file combination), the CPU 2 determines whether 15 the operator desires to couple the document file and the form file prior to the image file transmission (S193). When the result at step S193 is negative, the operational screen (the initial menu), shown at the upper part of FIG. 24, is displayed on the display unit 3. As shown in FIG. 24, after the "DESTN" button in the initial menu is 20 depressed by the operator, the CPU 2 causes the operational screen (the destination list), shown at the lower part of FIG. 24, to be displayed on the display unit 3. Then, the CPU 2 causes the operator to select a desired destination from among the plurality of destination identifiers of the destination list displayed on the display 25 unit 3. In the example of FIG. 24, the destination identifiers of the

destination list are department names of a certain company, and one of the department names in the destination list is selected as the destination by the operator. After the destination is selected by the operator, the CPU 2 causes the network I/F unit 5 to transmit one of 5 the document files through the network 12 to the external computer 11, which is indicated by the selected destination, by using the receiving method (S191). After the step S191 is performed, the CPU 2 determines whether all the document files are transmitted to the destination (S192). When the result at step S192 is negative, the 10 control of the CPU 2 is transferred to the step S191. Otherwise the image file transmission procedure of FIG. 26 is finished.

When the result at step S185 is affirmative (or when the operator desires the file combination), the CPU 2 reads the selected 15 document files from the image memory 6 (S186). Suppose that, in this case, the operator desires to combine the document file “19990924171030” and the document file “DOC-A”, indicated in the document file list of FIG. 23, prior to the image file transmission, and a combined document file is created from the two files. The CPU 2 causes the image processor 4 to arrange the selected 20 document files in order of the selection (S187).

After the step S187 is performed, the CPU 2 causes the image processor 4 to convert, if needed, the selected document files according to the given file format (S188). The CPU 2 creates a 25 combined document file from the selected document files, and modifies the number of pages included in the document information

file of the selected document files by incrementing the number of pages (S189). FIG. 25 shows a structure of the image data files stored in the image memory 6 after the step S189 is performed. As shown in FIG. 25, the image data file "DOCUMENT-001.IMG" and the image format file "DOCUMENT-001.PAGEINFO" are newly included in the image memory 6. In this case, the number of pages included in the document information file is changed from 10 to 11.

5 After the step S189 is performed, the CPU 2 stores the modified document information file into the image memory 6 (S190).

10 After the step S190 is performed, the control of the CPU 2 is transferred to the step S191, and the combined document file is transmitted at the step S191 through the network 12 to the external computer 11, which is indicated by the selected destination, by using the receiving method.

15 When the images of the selected document files have the same number of gray levels, it is possible to convert the selected document files into the multiple-page TIFF format files based on the corresponding document format files. In such a case, the document file, such as "990924171030.TIFF", is transmitted through the 20 network 12 to the destination.

In the above-described embodiment, the file combining process is carried out by the CPU 2 of the image processing device 10. Alternatively, the document file combining process may be carried out by the external computer 11 instead of the CPU 2 of the 25 image processing device 10. In such a case, the controller of the

external computer 11 performs the steps S186 through S190 of the image file transmission procedure shown in FIG. 26.

When the result at step S193 is affirmative, the control of the CPU 2 is transferred to step S200 of FIG. 28, which will be
5 described below.

In the image processing system of the present embodiment, which is described with reference to FIG. 27, FIG. 28 and FIG. 1, a combined image file, derived from the image data of the image memory 6, is transmitted from the image processing device 10 to one
10 of the external computers 11 through the network 12.

FIG. 27 is a diagram for explaining a file combining process. FIG. 28 shows a file combining procedure executed by the image processing system of the present embodiment as a portion of the image file transmission procedure of FIG. 26.

15 As shown in FIG. 28, when the result at step S193 is affirmative (or when the operator desires to couple the document file and the form file prior to the image file transmission), the CPU 2 determines whether the operator desires to input offset values from the operation unit 7 when combining the two files (S200).

20 When combining the document file and the form file to create a combined image file, simple superimposing of one of the two files upon the other is inadequate for providing a proper page layout of the combined image file. The offset values, which indicate the differences in x and y position within the page between the
25 document file and the form file, are needed to provide a proper page

layout of the combined image file.

When the result at step S200 is negative, the CPU 2 performs the next step S201, which will be described below. When the result at step S200 is affirmative, the CPU 2 performs the next step S210, 5 which will be described later.

When the operator does not desire to input the offset values (or when the result at step S200 is negative), the CPU 2 reads the selected document files that are to be combined, from the image memory 6 (S201). Suppose that, in the present embodiment, the 10 form file "g", indicated by (a) in FIG. 27, contains picture elements "g(Xi, Yj)", the document file "h", indicated by (b) in FIG. 27, contains picture elements "h(Xi, Yj)", and the combined image file "NEW", indicated by (c) in FIG. 27, contains picture elements "NEW(Xi, Yj)". The image combination of the two files is 15 achieved by performing OR operations of the two image data, as in the following equation:

$$NEW(Xi, Yj) = f(g(Xi, Yj), h(Xi, Yj)) \quad (1)$$

where Xi indicates the i -th picture element in the main scanning direction, and Yj indicates the j -th picture element 20 in the sub-scanning direction.

It is assumed that the conditions $1 \leq i \leq$ main scan width (the total number of picture elements of the file in the main scanning direction) and $1 \leq j \leq$ sub-scan width (the total number of picture elements of the file in the sub-scanning direction) are satisfied.

25 After the step S201 is performed, the CPU 2 sets the counter

“i” to 1 (S202), and sets the counter “j” to 1 (S203). The CPU 2 calculates the results of OR operations of the two image data, and stores the values of $f(g(X_i, Y_j), h(X_i, Y_j))$ in the ROM/RAM 8 (S204). After the step S204 is performed, the CPU 2 increments the counter “i” (S205).

After the step S205 is performed, the CPU 2 determines whether the value of the counter “i” exceeds the main scan width (S206). When the result at step S206 is negative, the control of the CPU 2 is transferred to the step S204. Otherwise the CPU 2 increments the counter “j” (S207), and sets the counter “i” to 1 (S208).

After the step S208 is performed, the CPU 2 determines whether the value of the counter “j” exceeds the sub-scan width (S209). When the result at step S209 is negative, the control of the CPU 2 is transferred to the step S204. Otherwise the combined image file is created from the two files, and the control of the CPU 2 is transferred to the step S188 shown in FIG. 26. As described earlier, the image file transmission procedure is carried out with respect to the combined image file.

On the other hand, when the result at step S200 is affirmative (or when the operator desires to input the offset values), the CPU 2 causes the display unit 3 to display a request of inputting of the offset values (m, n) (S210). After the step S210 is performed, the CPU 2 causes the operator to input the offset values (m, n) from the operation unit 7 (S211).

After the step S211 is performed, the CPU 2 reads the selected document files that are to be combined, from the image memory 6 (S212). Suppose that, in the present embodiment, the form file "g", indicated by (a) in FIG. 27, contains picture elements "g(Xi, Yj)", 5 the document file "h", indicated by (b) in FIG. 27, contains picture elements "h(Xi-m, Yj-n)", and the combined image file "NEW", indicated by (c) in FIG. 27, contains picture elements "NEW(Xi, Yj)". The image combination of the two files with the offset is achieved by performing OR operations of the two image data with 10 the offset values considered, as in the following equation:

$$\text{NEW}(X_i, Y_j) = f(g(X_i, Y_j), h(X_{i-m}, Y_{j-n})) \quad (2)$$

where X_i indicates the i -th picture element in the main scanning direction, and Y_j indicates the j -th picture element in the sub-scanning direction.

15 It is assumed that the conditions $1 \leq i - m \leq$ the main scan width (the total number of picture elements of the file in the main scanning direction) and $1 \leq j - n \leq$ the sub-scan width (the total number of picture elements of the file in the sub-scanning direction) are satisfied.

20 After the step S212 is performed, the CPU 2 sets the counter "i" to 1 (S213), and sets the counter "j" to 1 (S214). The CPU 2 determines whether the value of " $i - m$ " is larger than 1 (S215). When the result at step S215 is affirmative, the CPU 2 determines whether the value of " $j - n$ " is larger than 1 (S216). Otherwise the 25 control of the CPU 2 is transferred to step S218, which will be

described later.

When the result at step S216 is affirmative, the CPU 2 calculates the results of OR operations of the two image data with the offset values considered, and stores the values of $f(g(X_i, Y_j), h(X_{i-m}, Y_{j-n}))$ into the ROM/RAM 8 (S217). After the step S217 is 5 performed, the CPU 2 increments the counter "i" (S218).

After the step S218 is performed, the CPU 2 determines whether the value of the counter "i" exceeds the main scan width (S219). When the result at step S219 is negative, the control of the 10 CPU 2 is transferred to the step S215. Otherwise the CPU 2 increments the counter "j" (S220), and sets the counter "i" to 1 (S221).

After the step S221 is performed, the CPU 2 determines whether the value of the counter "j" exceeds the sub-scan width 15 (S222). When the result at step S222 is negative, the control of the CPU 2 is transferred to the step S215. Otherwise the combined image file is created from the two files with the offset values considered, and the control of the CPU 2 is transferred to the step S188 shown in FIG. 26. As described earlier, the image file 20 transmission procedure is carried out with respect to the combined image file.

When the result at step S216 is negative, the CPU 2 increments the counter "j" (S223). After the step S223 is performed, the control of the CPU 2 is transferred to the step S222.

25 In the above-described embodiment, both the file combining

process and the combined image file transmission process are carried out by the CPU 2 of the image processing device 10. Alternatively, the file combining process may be carried out by the external computer 11, instead of the CPU 2 of the image processing device 10.

5 In such alternative embodiment, after the combined image file, transmitted by the image processing device 10, is received at the external computer 11, the controller of the external computer 11 performs the steps S200 through S223 of the file combining procedure of FIG. 28, and performs only the steps S188 through 10 S190 of the procedure of FIG. 26.

Accordingly, the image processing device, method and system of the present embodiment are effective in enabling the receiver of the image file to immediately overview the contents of the image file or the like, so as to increase the convenience of the remote 15 scanning capability to the users. The image processing device, method and system of the present embodiment are effective in enabling the receiver's computer to perform various post-processing procedures of the image file after the reception of the image file, in order to increase the convenience of the remote scanning capability 20 to the users.

Next, a description will be given, with reference to FIG. 29 through FIG. 36, of a fourth preferred embodiment of the remote-scan image processing system of the invention.

FIG. 29 shows the fourth preferred embodiment of the remote-scan image processing system of the invention. As shown in FIG. 29,

the remote-scan image processing system of the present embodiment is essentially the same as that of the previous embodiment shown in FIG. 1 except that the image processing device 10 of the present embodiment further includes a printer unit 9 connected to the local bus. In the image processing system of the present embodiment, the image processing device 10, and the plurality of external computers (PC) 11, connected to the image processing device 10 through the local area network 12, are provided. In FIG. 29, the elements that are essentially the same corresponding elements in FIG. 1 are designated by the same reference numerals, and a description thereof will be omitted.

In the image processing system shown in FIG. 29, image data are read from various documents by the scanner unit 1 of the image processing device 10 (which will be called the IPD 10), and the image data are stored, together with personnel information (which includes at least a personnel identifier, a pertinent department and so on) that is related to the operator who stores the image data by optically reading the documents, into the image memory 6. Further, in the image processing system of the present embodiment, the image data are transmitted, together with the stored personnel information, from the IPD 10 to one of the external computers 11 through the network 12. A number of personnel information items allocated for a number of personnel of the company are stored in a personnel database DB (which may be provided in the ROM/RAM 8 or elsewhere on the local bus), and the personnel database is

connected to the IPD 10 via the local bus.

Further, in the image processing system shown in FIG. 29, the IPD 10 is provided with the printer unit 9, and, by printing the images of document files by using the printer unit 9, the operator 5 can easily observe the offset values needed when combining the document files.

In the image processing system of the present embodiment, which is described with reference to FIG. 29 through FIG. 31B, image data are read from various documents by the scanner unit 1 of 10 the IPD 10, and the image data are stored in the image memory 6.

FIG. 30 shows an image data storage procedure that is executed by the CPU 2 of the IPD 10 in the image processing system of the present embodiment. FIG. 31A and FIG. 31B show input screens that are displayed on the display unit 3 and the operation 15 unit 7 of the IPD 10 when the procedure of FIG. 30 is performed.

At a start of the image data storage procedure of FIG. 30, the CPU 2 causes the display unit 3 to display a request of inputting of a personnel identifier of the operator thereon as shown in FIG. 31A (S230). The CPU 2 receives the personnel identifier that is input by 20 the operator from the operation unit 7 (S231). The CPU 2 reads the relevant personnel information (including the personnel name, the pertinent department and so on) from the personnel database based on the received personnel identifier (S232). After the step S232 is performed, the CPU 2 temporarily stores the personnel information 25 in a memory of the CPU 2 or the ROM/RAM 8 (S233).

After the step S233 is performed, the CPU 2 causes the display unit 3 to display an initial document name thereon (S234). The CPU 2 causes the operator on the operation unit 7 to set a desired document name of image data that will be read from a document and stored in the image memory 6 as shown in FIG. 31B (S235).

For example, suppose that, as a result of step S235, the operator inputs the document name "XYZ" from the operation unit 7 as shown in FIG. 31B. The CPU 2 causes the display unit 3 to display a request of selection of a desired destination of the image data on the display unit 3 (S236). The CPU 2 receives the destination and scan condition of the image data that are selected by the operator on the operation unit 7 (S237).

After the step S237 is performed, the CPU 2 causes the operator to set the document on the contact glass of the scanner unit 1 or the ADF of the scanner unit 1 (S238). When the document to be scanned is a book-type document, it is set on the contact glass. When the document to be scanned is a cut-sheet document, it is set on the ADF. After the step S238 is performed, the CPU 2 causes the operator to depress the start button in the operation unit 7 to start the scanner unit 1 (S240). The CPU 2 temporarily stores the selected destination into the ROM/RAM 8 (S241).

After the step S241 is performed, the CPU 2 performs the image reading of the document by controlling the scanner unit 1 (S242). The CPU 2 stores the image data, obtained at the step S242, into the image memory 6 (S243).

After the step S243 is performed, the CPU 2 determines whether an end of the document is detected by the scanner unit 1 (S245). When the result at step S245 is negative, the control of the CPU 2 is transferred to the step S242. Otherwise the CPU stores the 5 selected destination, the number of pages of the image data and the file format of the image data, as well as the personnel information obtained at the step S233, into the image memory 6 together with the image data (S246). After the step S246 is performed, the image processing procedure of FIG. 30 is finished.

10 Similar to the previous embodiments, the stored image data of the image memory 6 are transmitted from the IPD 10 through the network 12 to one of the external computers 11 that is designated as the destination.

15 In the present embodiment, the structure of files stored in the image memory 6 is the same as that of the previous embodiment shown in FIG. 21. The personnel information described above is contained in the document information file (e.g., "19990924171030.DOCINFO" shown in FIG. 21) that is stored in the image memory 6 of the present embodiment.

20 In the image processing system of the present embodiment, which is described with reference to FIG. 32 through FIG. 34D, a combined image file is created from plural document files of the image memory 6 of the IPD 10, and the combined image file is transmitted from the IPD 10 to one of the external computers 11 25 through the network 12.

FIG. 32 shows a first portion of a file combining procedure executed by the CPU 2 of the IPD 10 in the image processing system of the present embodiment. FIG. 33 shows a second portion of the file combining procedure executed by the CPU 2 of the IPD 10 in the image processing system of the present embodiment. FIG. 34A, FIG. 5 34B, FIG. 34C and FIG. 34D show an example of the file combining process in which plural document files are combined together.

The file combining procedure of FIG. 32, which uses the printing of a combined image file, allows the operator to easily 10 determine the offset values that are needed to provide a proper page layout of the combined image file. The file combining procedure of FIG. 33, which uses the offset values input by the operator as the result of the first-portion file combining procedure of FIG. 32, allows accurate page layout of the combined mage file.

15 At a start of the file combining procedure of FIG. 32, the CPU 2 reads the image data of the stored document files from the image memory 6 (S250). The CPU 2 causes the display unit 3 to display a document list, containing a number of document names or identifiers of the document files of the image memory 6, based on the read 20 image data (S251).

With the document list displayed, the CPU 2 causes the operator to select a desired document file from the document list by inputting key-in information (S252). After the step S252 is performed, the CPU 2 causes the display unit 3 to invert the 25 indication of the selected document file within the document file list

(S253). After the step S253 is performed, the CPU 2 determines whether all the document files that should be transmitted are selected (S254).

When the result at step S254 is negative, the control of the
5 CPU 2 is transferred to the step S252. Otherwise the CPU 2 determines whether the operator desires to combine the document files prior to the image file transmission (S255).

When the result at step S255 is negative (or when the operator
does not desire the file combination), the control of the CPU 2 is
10 transferred to an image file transmission process that is the same as
the steps S191 and S192 in the procedure shown in FIG. 26.

When the result at step S255 is affirmative (or when the operator desires the file combination), the CPU 2 reads the selected document files that are to be combined, from the image memory 6
15 (S256). Suppose that, in the present embodiment, the form file "g", shown in FIG. 34A, contains picture elements "g(Xi, Yj)", the document file "h", shown in FIG. 34B, contains picture elements "h(Xi, Yj)", and a combined image file without considering the offset values, shown in FIG. 34C, contains picture elements "f(Xi, Yj)". The image combination of the two files is achieved by
20 performing OR operations of the two image data. It is assumed that the conditions $1 \leq i \leq$ the main scan width, and $1 \leq j \leq$ the sub-scan width are satisfied.

After the step S256 is performed, the CPU 2 sets the counter
25 "i" to 1 (S257), and sets the counter "j" to 1 (S258). The CPU 2

calculates the results of OR operations of the two image data, and stores the values of $f(g(X_i, Y_j), h(X_i, Y_j))$ into the ROM/RAM 8 (S259). After the step S259 is performed, the CPU 2 increments the counter "i" (S260).

5 After the step S260 is performed, the CPU 2 determines whether the value of the counter "i" exceeds the main scan width (S261). When the result at step S261 is negative, the control of the CPU 2 is transferred to the step S259. Otherwise the CPU 2 increments the counter "j" (S262), and sets the counter "i" to 1
10 (S263).

After the step S263 is performed, the CPU 2 determines whether the value of the counter "j" exceeds the sub-scan width (S264). When the result at step S264 is negative, the control of the CPU 2 is transferred to the step S259. Otherwise the combined
15 image file is created from the two files without considering the offset values, and the CPU 2 causes the printer unit 9 to print the image of the combined image file on paper (S265). After the step S265 is performed, the control of the CPU 2 is transferred to step S266 shown in FIG. 33, which will be described later.

20 As the result of the step S265, the operator obtains the printed image of the combined image file as shown in FIG. 34C. As the offset values between the two files are not considered, the simple superimposing is inadequate for providing a proper page layout of the combined image file. The printed image sheet, produced by the
25 printer unit 9, includes a vertical scale 14a that is parallel to the

sub-scanning direction and a horizontal scale 14b that is parallel to the main scanning direction. Hence, the operator easily determines the offset values (m, n) that provide a proper page layout of the combined image file, by observing the relationship in position 5 between the scales 14a and 14b and the printed image.

At a start of the file combining procedure of FIG. 33, the CPU 2 determines whether the operator inputs the offset values in order to provide a proper page layout of the combined image file (S266). When the result at step S266 is negative, the control of the CPU 2 is 10 transferred to the image file transmission process that is the same as the steps S191 and S192 in the procedure shown in FIG. 26.

When the result at step S266 is affirmative, the CPU 2 receives the offset values (m, n) that are input by the operator from the operation unit 7 (S267). After the step S267 is performed, the 15 CPU 2 sets the counter "i" to 1 (S268), and sets the counter "j" to 1 (S269). The CPU 2 determines whether the value of "i - m" is larger than 1 (S270). When the result at step S270 is affirmative, the CPU 2 determines whether the value of "j - n" is larger than 1 (S271). Otherwise the control of the CPU 2 is transferred to step S273, 20 which will be described later.

When the result at step S271 is affirmative, the CPU 2 calculates the results of OR operations of the two image data with the offset values considered, and stores the values of $f(g(X_i, Y_j), h(X_i-m, Y_j-n))$ into the ROM/RAM 8 (S272). After the step S272 is 25 performed, the CPU 2 increments the counter "i" (S273).

After the step S273 is performed, the CPU 2 determines whether the value of the counter "i" exceeds the main scan width (S274). When the result at step S274 is negative, the control of the CPU 2 is transferred to the step S270. Otherwise the CPU 2 increments the counter "j" (S275), and sets the counter "i" to 1 (S276).

After the step S276 is performed, the CPU 2 determines whether the value of the counter "j" exceeds the sub-scan width (S277). When the result at step S277 is negative, the control of the CPU 2 is transferred to the step S270. Otherwise the combined image file "NEW", as shown in FIG. 34D, is created from the two files with the offset values considered, and the control of the CPU 2 is transferred to the image file transmission process that is the same as the steps S191 and S192 in the procedure shown in FIG. 26. As described earlier, the image file transmission procedure is carried out with respect to the combined image file.

When the result at step S270 is negative, the control of the CPU 2 is transferred to the step S273, and the steps S271 and S272 are not performed.

When the result at step S271 is negative, the CPU 2 increments the counter "j" (S278). After the step S278 is performed, the control of the CPU 2 is transferred to the step S277.

According to the above-described embodiment, the image processing device 10 can create a combined image file having a proper page layout, from plural document files of the image memory

6 of the IPD 10.

In the above-described embodiment, both the file combining process and the combined image file transmission process are carried out by the CPU 2 of the image processing device 10. Alternatively, 5 the file combining process may be carried out by the external computer 11, instead of the CPU 2 of the image processing device 10. In such alternative embodiment, after the combined image file, transmitted by the image processing device 10, is received at the 10 external computer 11, the controller of the external computer 11 performs the steps S250 through S278 of the file combining procedure of FIG. 32 and FIG. 33.

FIG. 35A, FIG. 35B and FIG. 35C show an example of the file combining process in which plural document files are combined together. FIG. 36 shows a file combining procedure executed by 15 the CPU 2 of the IPD 10 in the image processing system of the present embodiment.

In the image processing system of the present embodiment, which is described with reference to FIG. 35A through FIG. 36, the determination of the offset values, which is manually carried out by 20 the operator by observing the printed image derived from the procedure of FIG. 32, is automatically carried out.

At a start of the file combining procedure of FIG. 36, the CPU 2 reads the image data of the stored document files from the image memory 6 (S280). The CPU 2 causes the display unit 3 to display a 25 document list, containing a number of document names or identifiers

of the document files of the image memory 6, based on the read image data (S281).

With the document list displayed, the CPU 2 causes the operator to select a desired document file from the document list by 5 inputting key-in information (S282). After the step S282 is performed, the CPU 2 causes the display unit 3 to invert the indication of the selected document file within the document file list (S283). After the step S283 is performed, the CPU 2 determines whether all the document files that should be transmitted are 10 selected (S284).

When the result at step S284 is negative, the control of the CPU 2 is transferred to the step S282. Otherwise the CPU 2 determines whether the operator desires to combine the document files prior to the image file transmission (S285).

15 When the result at step S285 is negative (or when the operator does not desire the file combination), the control of the CPU 2 is transferred to an image file transmission process that is the same as the steps S191 and S192 in the procedure shown in FIG. 26.

When the result at step S285 is affirmative (or when the 20 operator desires the file combination), the CPU 2 reads the selected document files that are to be combined, from the image memory 6 (S286). Suppose that, in the present embodiment, the form file "g", shown in FIG. 35A, contains picture elements "g(Xi, Yj)" with a black dot 15a attached to the start position of the image thereof, the 25 document file "h", shown in FIG. 35B, contains picture elements

“h(Xi, Yj)” with a black dot 15b attached to the start position of the image thereof, and a combined image file “NEW”, shown in FIG. 35C, contains picture elements “f(Xi, Yj)”. The image combination of the two files is achieved by performing OR operations of the two image data such that the black dot 15b of the file “h” matches with the black dot 15a of the file “g”. It is assumed that the conditions $1 \leq i \leq$ the main scan width, and $1 \leq j \leq$ the sub-scan width are satisfied.

After the step S286 is performed, the CPU 2 sets the counter “i” to 1 (S287), and sets the counter “j” to 1 (S288). The CPU 2 determines whether the black dot 15a of the file “g” is located at the current position indicated by the counter “i” and the counter “j” (S289). When the result at step S289 is negative, the control of the CPU 2 is transferred to step S290, which will be described later.

When the result at step S289 is affirmative, the CPU 2 stores the position (Xi, Yj) as the black mark location (S295). After the step S295 is performed, the control of the CPU 2 is transferred to the step S267 shown in FIG. 33.

The CPU 2 increments the counter “i” (S290). After the step S290 is performed, the CPU 2 determines whether the value of the counter “i” exceeds the main scan width (S291). When the result at step S291 is negative, the control of the CPU 2 is transferred to the step S289. Otherwise the CPU 2 increments the counter “j” (S292), and sets the counter “i” to 1 (S293).

After the step S293 is performed, the CPU 2 determines

whether the value of the counter "j" exceeds the sub-scan width (S294). When the result at step S294 is negative, the control of the CPU 2 is transferred to the step S289. Otherwise the procedure of FIG. 36 is finished. As the result of the step S295, the black dot 5 position (Xi, Yj) with respect to the file "g" is determined and stored. Similarly, the black dot position (Xi, Yj) with respect to the file "h" is also determined and stored by performing the steps S287 to S294 shown in FIG. 36.

In the present embodiment, the CPU 2 calculates the offset 10 values (m, n) that provides a proper page layout of the combined image file, based on the black dot positions stored at the step S295 shown in FIG. 36. Thus, the calculated offset values (m, n) are used at the step S267 in the file combining procedure of FIG. 33.

According to the above-described embodiment, with the automatic 15 determination of the offset values, the image processing device 10 can create a combined image file having a proper page layout, from plural document files of the image memory 6 of the IPD 10. Further, the combined image file is transmitted from the image processing device 10 to one of the plurality of external computers 11 through 20 the network 12.

In the above-described embodiment, both the file combining process and the combined image file transmission process are carried 5 out by the CPU 2 of the image processing device 10. Alternatively, the file combining process may be carried out by the external 10 computer 11, instead of the CPU 2 of the image processing device 10.

In such alternative embodiment, after the combined image file, transmitted by the image processing device 10, is received at the external computer 11, the controller of the external computer 11 performs the steps S280 through S294 of the file combining procedure of FIG. 36.

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The image processing device, method and system of the present embodiment are effective in enabling the receiver of the image file to immediately overview the contents of the image file or the like, so as to increase the convenience of the remote scanning capability to the users. The image processing device, method and system of the present embodiment are effective in enabling the receiver's computer to perform various post-processing procedures of the image file after the reception of the image file, in order to increase the convenience of the remote scanning capability to the users.

Next, a description will be given, with reference to FIG. 37 through FIG. 41, of a fifth preferred embodiment of the remote-scan image processing system of the invention.

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FIG. 37 shows the fifth preferred embodiment of the remote-scan image processing system of the invention. As shown in FIG. 37, the remote-scan image processing system of the present embodiment is essentially the same as that of the previous embodiment shown in FIG. 29 except that the image processor 4 of the image processing device 10 of the present embodiment includes an image compression unit 17. In the image processing system of the present embodiment,

the image processing device 10 (which will be called the IPD 10), and the plurality of external computers (PC) 11, connected to the image processing device 10 through the local area network 12, are provided. In FIG. 37, the elements that are essentially the same 5 corresponding elements in FIG. 29 are designated by the same reference numerals, and a description thereof will be omitted.

In the image processing system shown in FIG. 37, the image compression unit 17 produces compressed image data from the image data read by the scanner unit 1 in accordance with the 10 available storage amount of the image memory 6. When reading image data from a document by using the scanner unit 1, the CPU 2 of the IPD 10 detects whether the available storage amount of the image memory 6 is less than the memory space needed to store the 15 read image data. When the available storage amount is less than the needed memory space, the CPU 2 calculates a proper compression ratio and causes the compression unit 17 to produce a compressed image data from the read image data by the calculated compression ratio. Therefore, the image data read by the scanner unit 1 can 20 safely be stored into the image memory 6 without causing an error in the image data storage procedure.

FIG. 38 shows an image data storage procedure executed by the CPU 2 of the IPD 10 in the image processing system of the present embodiment.

As shown in FIG. 38, at a start of the image data storage 25 procedure, the CPU 2 detects the available storage amount of the

image memory 6 (S300). Suppose that the document is set on the contact glass of the scanner unit 1 or the ADF thereof, and the number of pages of the document is input from the operation unit 7.

The CPU 2 causes the display unit 3 to display the initial menu, as shown in FIG. 5, which contains the scan condition selection list (S301). With the initial menu displayed, the CPU 2 causes the operator to input the scan condition choice, the destination identifier and others from the operation unit 7 (S302). The CPU 2 calculates the needed memory space based on the number of pages of the document and the selected scan condition (S303). The CPU 2 at this time detects whether the available storage amount of the image memory 6 is less than the memory space needed to store the read image data. When the available storage amount is less than the needed memory space, the CPU 2 calculates a proper compression ratio such that it enables the image memory 6 to store the read image data without causing an error (S304).

For example, suppose that the image reading conditions are: the available storage amount of the image memory 6 is 10 Mbytes, the document is A4 size and contains 10 pages, the selected scan condition is 200 dpi, and the images are in color and 8-bit gray scale. In this case, the amount of image data read from each page of the document is about 3.8 Mbytes, and the needed memory space amounts to about 38 Mbytes. In the present embodiment, the CPU 2, at the step S304, calculates the minimum compression ratio based on the ratio of the available storage amount to the needed memory

space, namely, $10 \text{ Mbytes} / 38 \text{ Mbytes} \times 100 = 26.3\%$.

After the step S304 is performed, the CPU 2 causes the operator to depresses the start button in the operation unit 7 to start the scanner unit 1 (S305). The CPU 2 performs the image reading of the document by controlling the scanner unit 1 (S306). The CPU 2 causes the image processor 4 to perform given image processing processes of the image data read by the scanner unit 1, and causes the image compression unit 17 to produce the compressed image data from the image data by using the compression ratio obtained at the step S304, and causes the image memory 6 to store the compressed image data, including the destination identifier and others, in the available storage portion of the image memory 6 (S307). As for the above case, the 26.3% compressed image data are safely stored in the image memory 6 without causing an error.

After the step S307 is performed, the CPU 2 determines whether an end of the image reading is detected by the scanner unit 1 (S308). When the result at step S308 is negative, the control of the CPU 2 is transferred to the step S306. When the result at step S308 is affirmative, the image data storage procedure of FIG. 38 is finished.

FIG. 39 shows another image data storage procedure executed by the CPU 2 of the IPD 10 in the image processing system of the present embodiment. In the present embodiment, a maximum compression ratio that is permissible to the image compression unit 17 when the image usage of image data is considered is

predetermined.

In the present embodiment, an image usage selection list is provided for the operator to select one of a plurality of image usage items for the image data read by the scanner unit 1, and maximum compression ratios are predetermined for the respective image usage items of the selection list such that each maximum compression ratio is suited to a corresponding image usage of the image data.

For example, the maximum compression ratios for the respective image usage items of the selection list such that "1/30" is set for thumbnail (T/N) images, "1/20" is for OCR images and "1/10" is set for high-quality reproduction images. An image usage selection menu including the image usage selection list is displayed on the display unit 3 prior to the image reading of the document.

At a start of the image data storage procedure shown in FIG. 39, the CPU 2 detects the available storage amount of the image memory 6 (S310). Suppose that the document is set on the contact glass of the scanner unit 1 or the ADF thereof, and the number of pages of the document is input from the operation unit 7.

The CPU 2 causes the display unit 3 to display the initial menu, as shown in FIG. 5, which contains the scan condition selection list (S311). With the initial menu displayed, the CPU 2 causes the operator to input the scan condition choice, the destination identifier and others from the operation unit 7 (S312). The CPU 2 calculates the needed memory space based on the number of pages of the document and the selected scan condition (S313).

The CPU 2 at this time detects whether the available storage amount of the image memory 6 is less than the memory space needed to store the read image data. When the available storage amount is less than the needed memory space, the CPU 2 calculates a proper 5 compression ratio (X) such that it enables the image memory 6 to store the read image data without causing an error (S314).

After the step S314 is performed, the CPU 2 causes the display unit 3 to display the image usage selection menu including the image usage selection list (S315). The CPU 2 causes the operator to select 10 one of the plurality of image usage items from the selection list (S316). After the step S316 is performed, the CPU 2 detects the maximum compression ratio (Y) that is predetermined for the selected image usage item (S317).

After the step S317 is performed, the CPU 2 determines 15 whether the calculated compression ratio (X) is above the maximum compression ratio (Y) (S318). When the result at step S318 is negative ($X < Y$), the CPU 2 selects the calculated compression ratio (X) (S319). In this case, the image data storage process would cause no error, and the CPU 2 allows the image reading of the document to 20 be performed by using the scanner unit 1 (S320). After the step S320 is performed, the control of the CPU 2 is transferred to the step S305 shown in FIG. 38.

When the result at step S318 is affirmative ($X \geq Y$), the 25 amount of the compressed image data obtained with the maximum compression ratio is excessively large, and the image data storage

process would cause an overflow of the image data in the image memory 6. The CPU 2 determines whether the operator accepts partial image reading of the document by the scanner unit 1 and the image data compression with the maximum compression ratio (S321).

5 When the result at step S321 is affirmative, the CPU 2 selects the maximum compression ratio (Y) (S322). The CPU 2 allows the image reading of the document to be performed by using the scanner unit 1 (S323). After the step S323 is performed, the control of the CPU 2 is transferred to the step S305 shown in FIG. 38.

10 When the result at step S321 is negative, the CPU 2 rejects the image reading of the document by the scanner unit 1 (S324). After the step S324 is performed, the procedure of FIG. 39 is finished.

15 FIG. 40 shows another image data storage procedure executed by the CPU 2 of the IPD 10 in the image processing system of the present embodiment. In the present embodiment, a minimum compression ratio that is permissible to the image compression unit 17 is predetermined regardless of which image usage of the image data is selected.

20 At a start of the image data storage procedure shown in FIG. 40, the CPU 2 detects the available storage amount of the image memory 6 (S330). Suppose that the document is set on the contact glass of the scanner unit 1 or the ADF thereof, and the number of pages of the document is input from the operation unit 7.

25 The CPU 2 causes the display unit 3 to display the initial menu, as shown in FIG. 5, which contains the scan condition

selection list (S331). With the initial menu displayed, the CPU 2 causes the operator to input the scan condition choice, the destination identifier and others from the operation unit 7 (S332). The CPU 2 calculates the needed memory space based on the number 5 of pages of the document and the selected scan condition (S333). The CPU 2 at this time detects whether the available storage amount of the image memory 6 is less than the memory space needed to store the read image data. When the available storage amount is less than the needed memory space, the CPU 2 calculates a proper 10 compression ratio (X) such that it enables the image memory 6 to store the read image data without causing an error (S334).

After the step S334 is performed, the CPU 2 detects the minimum compression ratio (Z) that is predetermined (S335). The CPU 2 determines whether the calculated compression ratio (X) is 15 above the minimum compression ratio (Z) (S336). When the result at step S336 is negative ($X < Z$), the CPU 2 selects the minimum compression ratio (Z) (S338). In this case, the image data storage process would cause no error, and the control of the CPU 2 is transferred to the step S305 shown in FIG. 38.

When the result at step S336 is affirmative ($X \geq Z$), the CPU 20 2 selects the calculated compression ratio (X) (S337). In this case, the image data storage process would cause no error, and the control of the CPU 2 is transferred to the step S305 shown in FIG. 38.

In the image processing system of the above-described 25 embodiment, the IPD 10 stores the image data, read from documents,

into the image memory 6 of the IPD 10 and transmits an image file, derived from the stored image data of the image memory 6 and containing the destination identifier and other identifiers, to one of the plurality of external computers (PC) 11 through the network 12.

5 The present invention is not limited to the above-described embodiment. Alternatively, one of the plurality of external computers 11 on the network 12 may perform the image data storage process in place of the IPD 10.

10 FIG. 41 shows an image data storage procedure performed in one embodiment of the image processing system of the invention.

In the image processing system shown in FIG. 41, a plurality of image processing devices (IPD) 10 and a plurality of external computers (PC) 11 are connected together via the local area network 12 (for example, the Ethernet). The plurality of external computers 15 11 on the network 12 include a server 11a that receives and stores image data sent by one of the IPDs 10, and transmits the stored image data to another external computer 11 through the network 12. Alternatively, two or more among the plurality of external computers 11 may be predetermined as being the servers 11a.

20 As shown in FIG. 41, in the image processing system of the present embodiment, one of the IPDs 10 reads the image data from documents by using the scanner unit 1, and transmits an image file, derived from the image data and containing the destination identifier and other identifiers, to the server 11a through the network 12. The 25 server 11a receives and temporarily stores the image data sent by the

one of the IPDs 10, and transmits the stored image data to the destination PC 11 through the network 12.

In the present embodiment, the image processing system can utilize the storage capacity of the external computer 11a, provided 5 as the server, to store a very large amount of image data, which exceeds the available storage amount of the image memory 6 of the IPD 10. According to the present embodiment, the IPD 10 can read a very large amount of image data from documents, which exceeds the available storage amount of the image memory 6 of the IPD 10, 10 and transmit the image data to the server 11a through the network 12.

The present invention is not limited to the above-described embodiments, and variations and modifications may be made without departing from the scope of the present invention.

Further, the present invention is based on Japanese priority 15 application No.2000-133598, filed on May 2, 2000, and Japanese priority application No.2000-233323, filed on August 1, 2000, the entire contents of which are hereby incorporated by reference.